
Viewpoint: Steven Ray on Information Standards in Manufacturing

Gahl Berkooz

‘Viewpoint’ presents current trends, research directions, end user perspectives, and vendors’ strategies that are shaping PLM today. ‘Viewpoint’ brings a pragmatic perspective focused on the ‘what’, ‘why’ and ‘how’ of PLM.

In this second edition of the column, I had the pleasure to invite **Steven R. Ray**, Chief Manufacturing Systems Integration Division at the US National Institute of Standards and Technology to give his perspectives on the changing role of Information Standards in Manufacturing. As the person directing the national US response in the area of information standards for manufacturing, Steve enjoys a unique vantage point on the field.

Steve notes that our times are characterised by an increase in the importance of mastering information standards as a competitive enabler. However, the scope of activities covered by information standards is growing, making it harder for companies to stay abreast of all the developments and opportunities. Steve’s organisation at NIST plays a key role in assuring that US manufacturers can efficiently incorporate information standards for manufacturing into their development plans.



Gahl Berkooz, PhD is Ford Motor Company’s Technical Leader for Systems Engineering and Product Creation Information Complexity Reduction. In this role he drives best practices in Process, Methods, Information, and Tools in Systems Engineering for Product Development, as well as defining and quantifying the impact of Product Information Complexity on business performance.

Dr Berkooz is developing Ford’s roadmap for driving down Product Information Complexity in support of global commonality and reduced development cycle times. Dr Berkooz joined Ford Motor Company after serving as Chief Analyst for PLM at D.H. Brown Associates. Prior to that Dr Berkooz served as CEO of technology companies in PLM. Dr Berkooz received his Doctorate from Cornell University in Applied Mathematics in 1991. Gahl can be reached at gberkooz@ford.com

Viewpoint of Steve Ray

GB: Steve, what in your view are the greatest challenges facing American manufacturers today, and how can information standards for manufacturing help address aspects of these challenges?

SR: While I cannot speak for the entire scope of issues facing American manufacturers, I do know that easy and reliable electronic information exchange among manufacturers and their suppliers and customers is becoming increasingly important. The reasons for this include the faster pace of business, the globalisation of supply chains, and the focus of many manufacturers on their core competencies while outsourcing the rest. All of these influences increase the need for high-fidelity, reliable communication of complex information such as designs, inventory, orders and invoices, maintenance logs, facility layouts, production reports, etc. Standards can be of tremendous help here because they insulate the users of the information systems from having to constantly re-implement translators from a given version of one system to some other version of another system. By relying on standards, manufacturers are able to pick best-of-breed information systems to manage their companies. Today's large OEMs are less and less able to simply require their suppliers to use the same software systems as they do, because those same suppliers work for other large customers as well. Where the OEMs are able to have their way, their suppliers are forced to maintain duplicative software systems – one per major customer – making them less efficient overall. Using standards for exchanging the information allows all the players to avoid such duplicative systems.

GB: What are the areas of activity in the Manufacturing Systems Integration Division at NIST, and how are these activities helping manufacturers?

SR: There are two principal areas where we focus our work. While industry does the heavy lifting in actually defining many standards, the Manufacturing Systems Integration Division works on the measurement and testing of solutions based on these standards. This can involve validation testing of a new standard to ensure it meets the needs of industry, conformance testing of systems purporting to be compliant with a given standard, and interoperability testing of systems that are trying to exchange information using a standard to ensure that the information is correctly understood at the receiving end. We also invest in longer-term research and development of next generation standards technology, such as semantic standards that will capture the meaning of information in a computable form.

GB: Do you feel the work preformed at NIST impacts small businesses differently than it does large businesses? If so, how?

SR: Small businesses definitely face more of a challenge when trying to keep up with the rapidly changing standards world. Often they do not have the research teams to participate in standards activities. Because of this, we team with the Manufacturing Extension Partnership (MEP) at NIST – a programme specifically targeting small and medium enterprises to help keep them aware of the developments with new standards, so that they can compete globally along with the large businesses.

GB: When I was involved in standards-related discussions at Ford I was amazed by the plethora of standards organisations, and the different levels of the design-manufacturing stack addressed by standards. It would seem to me a small or medium-manufacturing

enterprise would have great difficulty navigating this complexity and figuring out where to focus its energy. What would you recommend to a business that is starting to investigate which standards to adopt?

SR: First, I would recommend that a small business contact their nearest MEP centre – there should be one within a couple of hours drive from any manufacturer in the country. They can help a business tap into the nationwide MEP network of expertise in standards as well as new technology development. Second, I would recommend contacting the industrial consortia for the business' industry sector. Often it is the consortia that are carrying the load of standards development. For example, automotive suppliers might want to communicate with AIAG – the Automotive Industry Action Group, and OESA – the Original Equipment Suppliers Association just to name two.

GB: What are your thoughts regarding standard compliance verification? How can manufacturing companies have visibility into what to expect from a compliance statement from a software or hardware vendor?

SR: There is no single answer to this question. Some industry sectors use self-certification, where a software or hardware vendor tests its own products against some test suite, and stakes its reputation on its claim of compliance. Other sectors insist on a more formal certification programme administered by a third-party testing organisation. And yet others use nothing at all, and buyers are somewhat at the mercy of the vendors. The more organised an industry sector is, usually through a trade association that can insist on compliance metrics, the more confident buyers can be about the claims of vendors. But again, no single approach is always best for every sector.

GB: What do you feel are the areas of manufacturing and design standards that are in the greatest need of research, and what do you see as the opportunities such standards research can open?

SR: I see two types of opportunities before us. From the business perspective, I believe there is a beginning to be a strong convergence of electronic business and technical standards. Some are calling these P2B, or Plant-to-Business standards, and they should go a long way towards improving efficiencies within companies and throughout supply chains by exposing the daily operations to the financial perspective. On the technical front, there is a rising momentum behind moving beyond the simple transfer of data to deal with the meaning of that data in ways that can be reasoned with. You may have heard of the next stage in the evolution of the World Wide Web, which some have called the Semantic Web. This is an attempt to codify information in ways that allow computers to meaningfully navigate through the information, rather than what would otherwise be meaningless strings of words to a computer. These areas desperately need progress on the standards front.

GB: If we look at the semiconductor manufacturing area, we see strong standards in the area of MES protocols and other areas. Why do you feel that the semiconductor industry is so ahead of, say, automotive or aerospace?

SR: At the risk of oversimplification, I would say that the semiconductor industry enjoys a more homogeneous and focused community when compared to the automotive and aerospace industries. Auto and aerospace manufacturing covers an incredible scope of technologies and disciplines, from forging and casting of metals and alloys, to

composites, to nano-scale coatings, to fail-safe computer networks, with product life cycles from weeks to many decades. Because of this wide diversity, no single solution to integrating MES with the other standards works across the industry, not to mention throughout the supply chain that includes Mom & Pop shops. It will take time for a set of workable solutions to prove themselves in the marketplace.

GB: What is your vision for the future? Will we see continued fragmentation and refinement of standards according to the technology stack, or will we see more holistic standards focused on business processes? How are the activities of the Manufacturing Systems Integration Division driving this vision?

SR: I believe we will see both fragmentation and refinement of standards through the technology stack. As the lower tiers of standards become commodities, such as TCP/IP, there will be little further debate around the content of the standard, although it's realistic to expect evolutionary improvement. At the middleware layer, we are seeing convergence forces at work, such as with Web Services and ebXML. At the application level, there is still a lot of independent activity taking place – some industries are just beginning to move away from the fax and phone, some are embracing XML, and some are experimenting with semantic standards. At this domain-dependent application layer that we see the 'wild frontier' activity continuing for some time. As far as a vision for the future, I alluded earlier to the development of the Semantic Web. I foresee a future where the meaning of information is codified and the kind of explosion we saw with information access for people through the World Wide Web will repeat itself in the business world for computerised systems, with far greater economic impact than we have seen so far.



Steven R. Ray is Chief, Manufacturing Systems Integration Division at the National Institute of Standards and Technology. He manages a division dedicated to measurements and standards supporting systems interoperation in the manufacturing sector. He established a programme (TIMA – Technologies for the Integration of Manufacturing Applications) in the NIST Advanced Technology Programme, and served as Chairman of the IGES/PDES

Organisation that coordinated the US participation in the STEP standard (STEP – Standard for the Exchange of Product Model Data, ISO 10303). He received his PhD in Mechanical and Aerospace Engineering in 1981 from Princeton University, and his Bachelor's degree in Physics from the University of Bristol, England.